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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/572,172	03/15/2006	Masao Shimizu	B-5920PCT 623343-1	5175

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EXAMINER

FLOHRE, JASON A

ART UNIT	PAPER NUMBER
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4112

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/572,172	Applicant(s) SHIMIZU ET AL.	
	Examiner JASON FLOHRE	Art Unit 4112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 3/15/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/15/2006 8/9/2007 9/4/2008</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3, 4, 8, 9 11, and 12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 3 uses the function Cover(Lact) and Claim 4 uses the function SCover(LM), which depends on Cover(Lact) (see paragraph 84 equation 6). Cover(Lact) uses $\Delta_{\max}(\text{Lact})$ and $\Delta_{\min}(\text{Lact})$. It is stated in the specification that no calculation equation can be analytically shown (see paragraph 74) with respect to these variables. This prevents one of ordinary skill in the art from being able to calculate Cover(Lact) and SCover(LM) which are the basis of claims 3 and 4, without resorting to undue experimentation. Claims 8 and 11 depend from claim 3 and are rejected for the reason stated above. Claims 9 and 12 depend from claim 4 and are rejected for the reason stated above.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "small" in claim 2 is a relative term which renders the claim indefinite. The term "small" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The value of integers p and q have been rendered indefinite by the use of the term "small".

Claims 5 and 7-9 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: a driving mechanism which one-dimensionally drives an image capturing element within said image capturing device along an image capturing element moving direction. When used in conjunction with claim 1 (or claims 2-4 which depend on claim 1), as stated in the claims, both the object and the element would move in the same direction, this would mean that the image captured at each movement position would be the same as the initial image because both the object and the element are moving according to the same method.

Claims 6 and 10-12 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element. When used in conjunction with claim 1 (or claims 2-4 which depend on claim 1), as stated in the claims, both the object and the member would move in the same direction, this would mean that the image captured at each movement position would be the same as the initial image because both the object and the element are moving according to the same method.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (Japanese Patent Application Publication 10-327359), hereinafter referenced as Suzuki, in view of Oldham et al. (United States Patent 7,075,059), hereinafter referenced as Oldham.

Regarding claim 1, Suzuki discloses a method for high-resolution-izing, hereinafter referenced as super-resolution, an image by shifting the image sensor and taking two or more pictures as disclosed at paragraph 5, lines 2-5. Suzuki further

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discloses in figure 3 that the movement direction is one-dimensional, which is in fact a two-dimensional sub-pixel motion. Since the movement direction is an angle, it is well known in the art that any angle can be expressed in terms of a rational number. The numerator of the rational number defines the movement in the vertical direction and the denominator defines the movement in the horizontal direction. The fixed angle which the sensor moves normalizes the one directional moving direction. Therefore the above statements read on "along a predetermined one-dimensional moving direction, a sequential image of said image capturing object is captured by a fixed capturing device, said sequential image is set to a two-dimensional sub-pixel motion suitable for super-resolution processing, said one-dimensional moving direction of said image capturing object in a coordinate system normalized by aspect ratio of pixel of an image capturing element within said image capturing device is determined to p/q of a rational number, wherein: one pixel of vertical direction of said coordinate system is divided by an integer p , and one pixel of horizontal direction of said coordinate system is divided by an integer q ", however, Suzuki fails to disclose that the image capturing object is moved.

However, the examiner maintains that it was well known in the art to provide that the image capturing object is moved, as taught by Oldham.

In a similar field of endeavor Oldham discloses image enhancement by sub-pixel imaging. In addition, Oldham discloses that relative motion between the sample platform and the detector is achieved by the motion of the stage which reads on "an image capturing object is moved", as disclosed at column 12, lines 9-11.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Suzuki by specifically providing that an image capturing object is moved, as taught by Oldham, for the purpose of allowing for easier repair of the movement mechanism.

Regarding claim 2, Suzuki and Oldham disclose everything claimed as applied above (see claim 1), in addition, Oldham discloses that sub-pixel movements could $\frac{1}{2}$ pixel dimension steps. If the motion is defined to be a $\frac{1}{2}$ pixel step in both directions (x and y), then it is angle of 45 degrees, which is a p/q of $\frac{1}{8}$, as disclosed at column 2, lines 32-33. This reads on "wherein absolute value of said integer p and absolute value of said integer q are integers which is not a small integer".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Suzuki by specifically providing wherein absolute value of said integer p and absolute value of said integer q are integers which is not a small integer, as taught by Oldham, for the purpose of have a ratio which can be easily measured.

Regarding claim 5, Suzuki and Oldham disclose everything claimed as applied above (see claim 1), in addition, Suzuki discloses a driving mechanism (13C) which one-dimensionally drives an image capturing element within said image capturing device (12) along an image capturing element moving direction (M), as disclosed in figure 3. Suzuki further discloses that a sequential image of a fixed image capturing object is captured while said image capturing element is moved by said driving mechanism along said image capturing element moving direction and said sequential

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image is set to said two-dimensional sub-pixel motion image as disclosed at paragraph 5, lines 2-5.

Regarding claim 7, Suzuki and Oldham disclose everything claimed as applied above (see claim 21), in addition, Suzuki discloses a driving mechanism (13C) which one-dimensionally drives an image capturing element within said image capturing device (12) along an image capturing element moving direction (M), as disclosed in figure 3. Suzuki further discloses that a sequential image of a fixed image capturing object is captured while said image capturing element is moved by said driving mechanism along said image capturing element moving direction and said sequential image is set to said two-dimensional sub-pixel motion image as disclosed at paragraph 5, lines 2-5.

Claims 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki and Oldham in view of Wallerstein et al. (United States Patent Application Publication 2002/0012059), hereinafter referenced as Wallerstein.

Regarding claim 6, Suzuki and Oldham disclose everything claimed as applied above (see claim 1), however, the combination fails to disclose said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element. However, the examiner maintains that it was well known in the art to provide said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element, as taught by Wallerstein.

In a similar field of endeavor, Wallerstein discloses an imaging arrangement. In addition Wallerstein discloses lens (48) as disclosed at paragraph 56, line 2 and exhibited in figure 6, image sensor (118) and prism (116) as disclosed at paragraph 58, lines 6-8 and exhibited in figure 6. Rotation of the Pechan prism causes rotation of the image as disclosed at paragraph 64, lines 6-7. The above disclosures read on "said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Suzuki and Oldham by specifically providing said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element, as taught by Wallerstein, for the purpose of providing a low cost movement method while keeping the image capturing object stationary.

Regarding claim 10, Suzuki and Oldham disclose everything claimed as applied above (see claim 2), however, the combination fails to disclose said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element. However, the examiner maintains that it was well known in the art to provide said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element, as taught by Wallerstein.

In a similar field of endeavor, Wallerstein discloses an imaging arrangement. In addition Wallerstein discloses lens (48) as disclosed at paragraph 56, line 2 and

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exhibited in figure 6, image sensor (118) and prism (116) as disclosed at paragraph 58, lines 6-8 and exhibited in figure 6. Rotation of the Pechan prism causes rotation of the image as disclosed at paragraph 64, lines 6-7. The above disclosures read on "said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Suzuki and Oldham by specifically providing said image capturing device arranging a member for optically moving image in a predetermined direction between a lens and an image capturing element, as taught by Wallerstein, for the purpose of providing a low cost movement method while keeping the image capturing object stationary.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON FLOHRE whose telephone number is (571)270-7238. The examiner can normally be reached on Monday to Thursday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffery Harold can be reached on 571-272-7519. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ JAF /

/Tse Chen/

Primary Examiner,

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